

The renewed threat of vaccine-preventable diseases in the war-struck European continent

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One of the highlights of modern medicine has been the advent of safe and effective vaccines, which turned many infectious illnesses into preventable diseases. Much progress has been made in the area of prophylaxis, and the effects of successfully implemented national immunization programs were quick to show. Vaccinations have prevented at least 37 million deaths between 2000 and 2019,¹ and have led to enormous decreases in the incidence of major infectious diseases compared to the pre-vaccination era, specifically, a drop from 53.03 to 11.42 per 100000 population for diphtheria, from 1.54 to 0.39 per 100000 for tetanus, from 42.79 to 3.97 per 100000 for pertussis, from 5.23 to 0.06 per 100000 for poliomyelitis, and from 183.16 to 5.93 per 100000 for measles.²

However, the impact of vaccination on the epidemiology of infectious diseases can only be seen when a certain threshold of herd immunity is met, and this target is different for each infectious agent, as it is dependent on the route of transmission and the index of transmissibility for each pathogen. For instance, for diphtheria, which has a relatively low basic reproduction number (R_0), of 4-5, the critical vaccination coverage is 79-84% while for pertussis, which has a high R_0 of 10-18, coverage should be 95-99% to effectively contain the disease.³ When these vaccine coverage targets are not met, we are faced with a risk of resurgence of these important pathogens.

With the current military conflict in Ukraine, vaccine-preventable diseases now

present a renewed threat to the European continent, as highlighted by the European Centre for Disease Prevention and Control (ECDC).⁴ Medical services have been importantly impacted in war-struck Ukraine, and routine childhood immunizations have been put on hold as the main focus is now on seeking safe shelter or securing urgent medical care.

With the most recent vaccine coverage rates in Ukraine being reported as suboptimal for pertussis (81.3%), measles (81.9%) and COVID-19 (35.0%), and high numbers of cases reported each year in the country for each of these infections (Table 1), the risk of resurgence during the military conflict of vaccine-preventable diseases is quite real, with potential outbreaks being imminent either locally or in populations displaced to other European countries, which may or may not have met their own vaccination coverage targets.

For example, Ukraine has reported two cases of vaccine-derived polio virus type 2 in October 2021,⁴ with an immunization catch-up campaign for children 6 months to 6 years of age planned to start on 01 February 2022, but halted by the beginning of the military conflict that same month.⁵

Based on a thorough risk analysis, the ECDC has prepared a list of key vaccinations to be offered to Ukrainian refugees in the absence of documented evidence of prior vaccination. The ECDC prioritizes vaccination against COVID-19, measles-mumps-rubella and diphtheria-tetanus-pertussis-poliomyelitis-*Haemophilus influenzae* b, and further recommends vaccination against hepatitis B, meningococcal disease, pneumococcal disease, varicella, influenza, and tuberculosis.⁴

Romania, along with many European countries, has put in place the mechanisms needed to offer free medical care to all people displaced from Ukraine, and this includes access to age-appropriate vaccinations. However, vaccine hesitancy has long hindered efforts to

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Table 1. Transmissibility of key vaccine-preventable diseases and vaccine coverage rates needed to ensure continued control of disease in the European continent

Vaccine-preventable disease ^{4,5}	Basic reproduction number (R ₀) ³	Critical vaccination coverage ³	Latest vaccine coverage reported from Ukraine ⁴	Cases reported in Ukraine in 2020–2021 ⁴	Latest vaccine coverage reported from Romania ⁹
Diphtheria	4–5	79–84	81.3%	No	86.3%
Pertussis	10–18	95–99	81.3%	Yes	86.3%
Poliomyelitis	5–7	84–90	84.2%	Yes	86.3
Measles	11–18	96–99	81.9%	Yes	86.2%
SARS-CoV-2	2.5 (wild type)	80% (alpha) ⁷	35.0%	Yes	44.6% ¹⁰
	7 (delta)	93% (delta) ⁸			
	10 (omicron) ⁶	TBD (omicron)			

sustain adequate vaccination rates in many countries worldwide,¹¹ and Romania is not an exception, with only 55.1% of parents having good knowledge regarding vaccination of their children,¹² and a rate of vaccine hesitancy reported at 30.3%, with 11.7% vaccine refusal,¹³ which placed the country itself at suboptimal vaccine coverage (Table 1).

This highlights the need for targeted interventions to educate the general population regarding the safety and efficacy of approved vaccines, to directly address vaccine hesitancy in a language and with information that is adequate to each person's level of understanding, and to extend these services to displaced populations whenever needed, in order to increase the acceptability of planned catch-up vaccination campaigns, and to contain the potential spread of vaccine-preventable diseases as more and more people are being impacted by military conflict.

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